

QBF - 2020 - F2 N1

Q01. a) $V_y = V \cdot \sin 60^\circ = 20 \frac{\text{cm}}{\text{s}} \cdot \frac{\sqrt{3}}{2} \approx 17,32 \frac{\text{cm}}{\text{s}}$

$DP_y = 17,32 \frac{\text{cm}}{\text{s}} \cdot 9\text{s} = 155,88 \text{ cm} //$

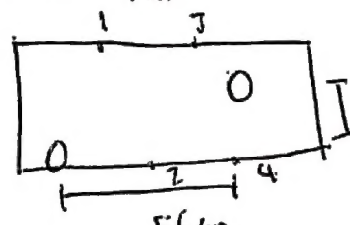
Logo como x:

$m \cdot \cos = 155,88 \text{ cm} \cdot \frac{100}{200} = 77,94 \rightarrow 77,94 \text{ cm} //$

b) $V_x = V \cdot \cos 60^\circ = 20 \frac{\text{cm}}{\text{s}} \cdot \frac{1}{2} = 10 \frac{\text{cm}}{\text{s}}$

$DP_x = 10 \frac{\text{cm}}{\text{s}} \cdot 9\text{s} = 90 \text{ cm}$

$DP_x + DP_y = DP_T \Rightarrow DP_T = 90 \text{ cm} + 155,88 \text{ cm} = 245,88 \text{ cm} //$

c)  $AS^2 = 56^2 + \left(\frac{68}{100}\right)^2 \approx 56,009 \text{ cm} //$

Q 02 $V = \frac{2\pi r}{T} \Rightarrow T = \frac{2\pi r}{V} \Rightarrow T^2 = \frac{4\pi^2 r^2}{V^2}$

$\frac{R_B^3}{R_A^3} = \frac{R_B^3}{R_A^3} \Rightarrow \frac{R_B^3}{R_A^3} = \frac{T_B^2}{T_A^2} \Rightarrow \frac{R_B^3}{R_A^3} = \frac{4\pi^2 R_B^2}{V_B^2} \Rightarrow \frac{R_B}{R_A} = \frac{V_A^2}{V_B^2} //$

$\frac{E_{CB}}{E_{CA}} = \frac{m \cdot V_B^2}{\frac{2}{m \cdot V_A^2}} \Rightarrow \frac{V_B^2}{V_A^2} = \frac{R_A}{R_B} = \frac{R_A}{\frac{3R_A}{2}} = \frac{2}{3} //$

03 (I) $t_x = t_2 - t_1$

$$t_x = 52\Omega \cdot \frac{1\Omega}{300} = \frac{26}{15}\Omega$$

$$\begin{aligned} v_1 \cdot t_1 &= s \\ v_2 \cdot t_2 &= s \end{aligned} \Rightarrow v_1 \cdot t_1 = v_2 \cdot t_2 \Rightarrow t_2 = \frac{v_1 \cdot t_1}{v_2} \text{ (II)}$$

$$\frac{v_1}{v_2} = 1,75$$

Donde $v_2 = 340 \frac{m}{s}$ e $v_1 \approx 3 \cdot 10^8 \frac{m}{s}$
Aplicando (II) em (I)

~~$$t_x = \frac{v_1 \cdot t_2}{v_2} + t_2 \Rightarrow t_x = t_2 \left(\frac{v_1}{v_2} + 1 \right) \Rightarrow t_2 \left(\frac{3 \cdot 10^8}{340} + 1 \right) = \frac{26}{15}$$~~

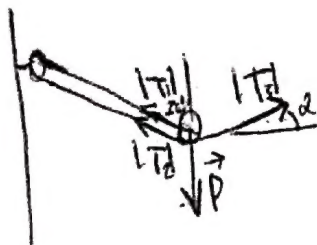
$$t_2 \left(1 - \frac{340}{3 \cdot 10^8} \right) = \frac{26}{15} \Rightarrow t_2 \approx \frac{26}{15} \cdot \frac{3 \cdot 10^8}{3 \cdot 10^8 - 340} \approx \frac{26}{15} \cdot \frac{3 \cdot 10^8}{3 \cdot 10^8} = 7$$

~~$$t_2 \approx 1,75\Omega \Rightarrow 340 \frac{m}{s} \cdot 1,75\Omega = 595m //$$~~

~~$$v_2 \cdot 340 \frac{m}{s} \cdot 1,75\Omega = 595m \approx d_1$$~~

04

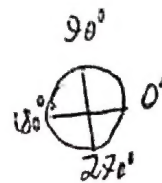
$$|T_1| = |T_2| = |T_3| = T$$



$$a) 2T \sin 30^\circ + T \cos 60^\circ$$

$$2 \cdot \frac{1}{2} = \cos \alpha$$

$$1 = \cos \alpha \rightarrow \alpha = 0^\circ$$



$$b) 2T \cos 30^\circ + T \sin 60^\circ = |P| \quad (\sin 0^\circ = 0)$$

$$2T \cdot \frac{\sqrt{3}}{2} = 600 \text{ N}$$

$$T \approx 390 \text{ N}$$

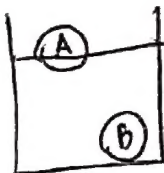
$$05 a) T_R = 92 \cdot 10^3 \cdot \frac{1 \text{ kg}}{9,2 \text{ s}} \cdot \frac{1 \text{ m/s}}{3 \text{ s}} \cdot \frac{1 \text{ kg}}{1 \text{ kg}} \cdot \frac{1 \text{ kg}}{10^3 \text{ kg}} \cdot \frac{1 \text{ kg}}{1 \text{ kg}} \cdot \frac{1 \text{ kg}}{1 \text{ kg}} = 20^\circ \text{C}$$

$$T_R = 20^\circ \text{C} + 15^\circ \text{C} = 35^\circ \text{C}$$

$$b) T_R = 4,2 \cdot 10^7 \cdot \frac{1 \text{ kg}}{9,2 \text{ s}} \cdot \frac{1 \text{ m/s}}{6,6 \text{ s}} \cdot \frac{60 \text{ kg}}{1 \text{ kg}} \cdot \frac{1 \text{ kg}}{1 \text{ kg}} \cdot \frac{1 \text{ kg}}{10^3 \text{ kg}} \cdot \frac{1 \text{ kg}}{1 \text{ kg}} \approx 9,09^\circ \text{C}$$

$$T_R \approx 9,09^\circ \text{C} + 24^\circ \text{C} = 33,09^\circ \text{C} //$$

06



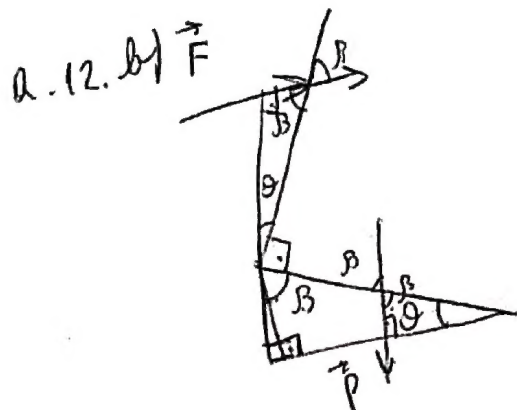
$$\vec{F}_{PA} = 0 \rightarrow EA = PA$$

$$\frac{105 \mu \cdot 4 \cdot \text{Vol}_i}{100} = \text{Vol}_E \cdot g \cdot \frac{95 \mu}{100}$$

$$\text{Vol}_i = \frac{95}{105} \text{ Volt}$$

$$\text{Vol}_i + \text{Vol}_E = \text{Vol}_T \Rightarrow \text{Vol}_E = \frac{105 \text{ Volt}}{105} - \frac{95 \text{ Volt}}{105}$$

$$\text{Vol}_E = \frac{10 \text{ Volt}}{105} \Rightarrow \frac{\text{Vol}_E}{\text{Vol}_T} = \frac{10}{105} \text{ ou } \frac{2}{21} \text{ ou } \approx 0,095$$



Tudo se passa em uma

Enquanto a protelera inclina o braço de alavanca de \vec{F} aumenta e \vec{P} diminui, logo; inicialmente o torque de \vec{F} for maior a protelera tomba.

$$F \cdot X = P \cdot 20 \text{ cm}$$

$$100 \text{ N} \cdot X = 250 \text{ N} \cdot 20 \text{ cm}$$

$$X = 50 \text{ cm}$$

Logo

$$d_{\text{mín}} = 90 \text{ cm} - 50 \text{ cm} = 40 \text{ cm}$$

$$d_{\text{máx}} = 90 \text{ cm} + 50 \text{ cm} = 140 \text{ cm} //$$

$$a = F \cdot m \cdot d \Rightarrow 100 \text{ N} \cdot 25 \text{ kg} \cdot d \Rightarrow a = 4 \frac{\text{m}}{\text{s}^2} //$$

$$W \quad \bar{F}_m = \frac{9500 \text{ N}}{100 \text{ m}} \cdot \frac{25 \text{ m}}{10}$$

$$\bar{F}_m \cdot d = E_c$$

$$\bar{F}_m \cdot d = \frac{m \cdot V_x^2}{2}$$

$$\sqrt{\frac{2 \bar{F}_m \cdot d}{m}} = V_x$$

$$V_x \cdot m_x = V_0 \cdot m_0$$

$$5 \text{ kg} \cdot V_x = 10 \text{ g} \cdot \frac{1 \text{ kg}}{10^3 \text{ g}} \cdot V_0$$

$$500 V_x = V_0$$

$$500 \sqrt{\frac{2 \cdot 9500 \cdot 25}{100 \cdot 5}}$$

$$500 \sqrt{\frac{2 \cdot 9500 \cdot 25}{100 \cdot 5}} = V_0$$

$$V_0 \approx 53000 \frac{\text{m}}{\text{s}} //$$